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April 1, 1999

Dear Heather:

Enclosed is a copy of the public comment release of the Public Health Assessment for the Sandoval Zinc site that you requested. The public comment period has expired, and we are in the process of addressing the comments received. Additional work has been done on the site since the public comment release came out, and that information is also being added.

The initial health consultation from 1994 that you requested was never finalized, but this document includes all of the recommendations made in the initial health consultation.

When the finalized copy of the Public Health Assessment for Sandoval Zinc is available, I will be sure that a copy is sent to you. If you would like to contact Cathy Copley directly, she can be reached at (618) 656-6680. Feel free to contact me if you need further assistance.

Sincerely,

Tiffanie Saxer
Environmental Toxicologist

Public Health Assessment for

SANDOVAL ZINC COMPANY
SANDOVAL, MARION COUNTY, ILLINOIS
CERCLIS NO. ILD05390454
JANUARY 5, 1999

FEBRUARY 17, 1999



Sandoval Zinc Company

Public Comment Release

PUBLIC HEALTH ASSESSMENT

SANDOVAL ZINC COMPANY

SANDOVAL, MARION COUNTY, ILLINOIS

CERCLIS NO. ILD053980454

Prepared by:

Illinois Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment-Public Comment Release was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate. This document represents the agency's best efforts, based on currently available information, to fulfill the statutory criteria set out in CERCLA section 104 (i)(6) within a limited time frame. To the extent possible, it presents an assessment of potential risks to human health. Actions authorized by CERCLA section 104 (i)(11), or otherwise authorized by CERCLA, may be undertaken to prevent or mitigate human exposure or risks to human health. In addition, ATSDR will utilize this document to determine if follow-up health actions are appropriate at this time.

This document has previously been provided to EPA and the affected state in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. Where necessary, it has been revised in response to comments or additional relevant information provided by them to ATSDR. This revised document has now been released for a 30-day public comment period. Subsequent to the public comment period, ATSDR will address all public comments and revise or append the document as appropriate. The public health assessment will then be reissued. This will conclude the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR

actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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SUMMARY

The Illinois Department of Public Health (IDPH) completed a public health assessment (PHA) for the Sandoval Zinc site on May 4, 1995. Since the release of the 1995 PHA, several site activities have taken place. IDPH has reviewed and evaluated information from these activities, and offers new conclusions and recommendations for the site.

Overall, the Sandoval Zinc site poses no apparent public health hazard to most of the population in Sandoval. The site may be a public health hazard to preschool children with excessive hand-to-mouth activity exposed to residential surface soils with high levels of lead. However, blood sample results from children in a day care near the site did not show elevated levels of lead.

Based on current conditions, IDPH recommends the following:

1. Continue efforts to prevent trespassing on the site.
2. Continue educational efforts on methods to reduce exposure to metals in the residential environment.
3. Use procedures to minimize dust during on-site remedial operations.

PURPOSE

The Illinois Department of Public Health (IDPH) has reviewed information about several activities at the Sandoval Zinc site that have taken place since the release of the May 4, 1995 public health assessment, and offers updated conclusions and recommendations for the site.

BACKGROUND

The Sandoval Zinc site occupies about 13 acres southeast of Sandoval in Marion County, Illinois. It is an abandoned primary and secondary zinc smelter that was next to a coal mining operation. Primary smelting, including processing of zinc ores and associated trace metals, occurred from 1885 to 1915. From 1916 until the facility closed in 1985, the main operation was recycling used metal through secondary smelting. Coal was the primary fuel used to fire the smelting furnaces. Smelting waste may have been transported off the site and used as fill in Sandoval and other nearby communities. Airborne emissions occurred during regular operations and accidental fires. Surface water runoff transported wastes from the site into adjacent ditches, creeks, ponds, and farm properties.

The Illinois Environmental Protection Agency (Illinois EPA) sealed the site by court order in 1991. In spite of fencing and posted signs, trespassing continues. The site is not visible from the main roads or businesses. Most of the Sandoval residential area is west of Highway 51 (Attachment 1). Some small businesses are about one-half mile west of the site along Highway 51. A day care center with about 125 children enrolled is among these commercial properties. The

nearest home is north of Route 50, less than 0.5 miles northeast of the site. The population of Sandoval in 1990 was 1,535.

In the public health assessment developed by IDPH in 1995, the environmental data available at that time had shown that high levels of metals existed on or near the site. IDPH was concerned for the community because of the persistent and cumulative nature of some metals, including lead and zinc, associated with the site. IDPH used on-site concentrations to estimate exposure doses for children, teenagers, and adults trespassing onto the site. Estimated doses for children exceeded several health guidelines, but estimated doses for teenagers and adults did not. The contaminant of greatest concern was lead.

Recommendations of the 1995 Public Health Assessment included:

Cease/Reduce Exposure Recommendations:

1. The site properties need to be adequately secured and monitored on a regular basis to prevent access to wastes.
2. Education of residents should continue regarding methodologies to minimize exposures to environmental contamination. School parent-teacher organizations, parents, and operators of local day care centers should be contacted to alert them of any potential exposure risks.

Site Characterization Recommendations:

1. Surface soil samples in the nearest residential bare soils, including the day care, should be analyzed for heavy metals to rule out any potential exposures.
2. Some individual households with older workers and young children should be included in a program of dust analyses. If contaminants are found in significant concentrations in homes, education should be provided to reduce heavy metal sources in interior environments.
3. Blood lead analyses of area residents should be reviewed to determine if excessive exposures are occurring. Encourage Sandoval parents to comply with state regulations concerning blood lead testing of preschool children. Review existing and future blood lead data to determine if an excessive prevalence of elevations exists.
4. A private well survey and heavy metal sampling should be conducted of the private wells nearest the site. A survey of the existing monitoring wells should be completed to determine if any wells need to be properly abandoned.

Health Activities Recommendations:

1. Restrict public access to site areas.

2. Implement procedures to suppress dust generation and migration if any on-site removal/remedial operations, or demolition activities occur.
3. Where areas of significant off-site contamination are identified, consider strategies for minimizing exposures to site-related contaminated soils on private properties.
4. Implement community health education programs to inform residents how they can reduce their exposure to contaminated soils and dusts.

In May and June 1996, Illinois EPA collected additional environmental samples, interviewed area citizens, coordinated blood lead screening of children attending the nearby daycare facility, and collected residential soil samples. In September 1997, IEPA completed an Expanded Site Inspection Report (Illinois EPA, 1997). This document assesses these recent activities.

Site Visit

IDPH and Illinois EPA staff visited the site on May 19, 1998. Vandals had stolen or damaged much of the fence around the site. Tire tracks were seen throughout the property, winding through the unsecured buildings. Generally, the site is the same as described in the previous health assessment (IDPH, 1995). Open fields surround the site on all sides except to the north where the CSX Railroad tracks are found.

An area between operation buildings on the eastern portion of the site may have been used for processing water for smelting operations or a reservoir for waste water. A large farm pond outside the fence line contains metals in its sediment, supports aquatic life, and may be used for fishing and swimming. Tracks made by three-wheeled recreational vehicles and bicycles were found circling the pond. Part of the farm field next to the southern site boundary may be affected by the site because it is grey in color and supports little vegetation.

Smelting waste and cinders cover the site. This metal-rich fill has resulted in some contamination of the underlying aquifer. Exposure to metal-contaminated groundwater may have occurred in one home with a private well. Only one home responding to the 1990 census reported having a private dug well, and the remaining Sandoval households reported using municipal water from Centralia, Illinois.

Surface runoff from the site empties into drainage ditches outside the eastern and western fence lines. The ditches receive runoff from the fields north of the site via culverts built under the railroad tracks. The ditches divert water to the marshy areas to the south, eventually emptying into a local creek.

Some waste has been stored inside the buildings and many buildings are in disrepair. Paper and other "recycled" household goods were previously stored here. A fire weakened the metal supports for the roof and walls. The roof of one large building has collapsed to ground level. Another physical hazard that may only be problematic during rainy seasons is an in-ground

reservoir that collects water beneath one building. Two large aboveground storage tanks are located on the south side of the building complex. One tank appears to contain some fuel oil.

Construction debris such as lumber, bricks, and concrete chunks was scattered throughout the site. Other debris, such as rusted metal goods and broken glass, also is present. Because of its isolated location, the site is used as a dumping ground and discarded items regularly appear.

Illinois EPA has hired contractors to begin some clean up activities and develop better site security. These contractors were visiting the site on May 19, 1998.

DISCUSSION

Since IDPH had not identified elevated blood lead levels in children in the Sandoval zip code, plans were made in the summer of 1996 to screen volunteers from the 125 preschool children enrolled at a daycare less than 0.5 miles west of the site. IDPH provided information to the daycare operator and parents regarding methods to avoid and reduce potential lead exposures. An air-conditioned, mobile clinic was made available for one day in August 1996. Thirty-three children were tested for lead concentrations in whole blood, and no child had an elevated blood lead level (Marion County Health Department, 1996). The current standard for blood lead levels in young children and pregnant women is 10 micrograms per deciliter (ug/dL) of whole blood (U.S. DHHS, 1991).

Staff from Illinois EPA interviewed Sandoval residents in 1996. Former workers and long-time residents who provided information said they regularly observed smoke from the plant at the high school 1.25 miles from the site, and at the drive-in theater north of the site. Some employees went home ill with symptoms of headaches, chills, and vomiting. They estimated that the recovery time from these symptoms was about 8 hours. Crops grown next to the site were reported to have low yields. Individuals also reported that smelting waste was transported to private and public properties in Sandoval and surrounding communities to be used for fill, walkways, and roads. A pond east of the site was used for fishing and for swimming until a community swimming pool was constructed about 50 years ago.

Illinois EPA collected on-site waste and off-site residential soil samples in 1996. Surface soil samples from 0 to 6 inches deep were collected from five areas on the site. The samples appeared to consist of smelting wastes and cinders. These five samples were analyzed for organic and inorganic compounds.

Illinois EPA invited IDPH to participate in a workshop for middle school students at Sandoval on May 19, 1998. Before the workshop, IDPH staff accompanied Illinois EPA to the site to meet with contractors. Later that morning a workshop for approximately 70 students and their teachers was held. IDPH provided information regarding the health effects of lead to the audience and gave a "Get the Lead Out" videotape to the teacher who organized the workshop. Illinois EPA staff discussed funding and regulatory activities associated with placing the site on the National

Priority List. The purpose of this community health education program was to inform residents how they can avoid or reduce their exposures to metal-rich soil and dust.

Contaminants of Interest

IDPH compared the results of each soil sample with the appropriate screening comparison value used to select contaminants for further evaluation for carcinogenic and non-carcinogenic health effects. Chemicals found at levels greater than comparison values or those for which no comparison value exists were selected for further evaluation. A discussion of each health screening value used is found in Attachment 2.

IDPH evaluated the results of on site surface soil (waste) samples and sediment samples provided by Illinois EPA (Illinois EPA, 1997). The organic chemicals tested included volatile organic compounds, semivolatile organic compounds (SVOCs), and pesticides. One sample collected from an area associated with an oil storage tank contained some SVOCs. The remaining organic chemical results were estimated values or found in laboratory blanks and are not at levels of health concern.

The inorganic chemicals selected for further evaluation from on-site soil and sediment sampling data are listed in Table 1. The on-site metals that are most consistently elevated above background levels are cadmium, copper, lead, and zinc. Not surprisingly, zinc is the most enriched metal and is found in elevated concentrations in every sample analyzed.

Table 2 contains the inorganic chemicals of interest for the 23 residential properties sampled. Most of these samples were collected from 0 to 6 inches below ground level. These data are the basis for further discussion. Some chemicals were not selected for further review in this assessment because of low toxicity or low concentrations found in the residential soil samples. Inorganic chemicals that were not selected were aluminum, antimony, beryllium, calcium, iron, mercury, potassium, selenium, silver, sodium, thallium, vanadium, and cyanide.

Public Health Implications

This section includes discussions of potential health effects for possible exposure scenarios to contaminants found off the site. The concentration range, the mean value, and median value of the residential soil samples in units of milligrams of metal per kilogram of soil (mg/kg) are shown in Table 3.

Several completed exposure pathways exist at the site (Table 4). Because the peak operation of this facility pre-dates most environmental and worker protection regulations, it is suspected that former employees were chronically exposed to products, waste, and emissions via inhalation and ingestion. In addition, past operational air emissions distributed metals to surrounding properties, and past residents were likely exposed through inhalation and ingestion. Today, the site is abandoned.

Trespassing continues to be a problem at this isolated site in spite of fencing being repaired and replaced regularly. Illinois EPA has retained contractors to design a more durable type of fence to deter trespassers.

Residents may be exposed to metals in the soil in their yards. For one exposure scenario, IDPH assumed children were playing twice a week over a 5-year period in a contaminated area of the yard where vegetation was not very thick, and inadvertently ingested the soil. A "pica" child exhibits excessive hand-to-mouth activity and is considered to ingest 25 times more soil than a typical child. Estimated exposure doses were also calculated for adult residents who would be exposed to contaminated soil twice a week over a 5-year period, with a body weight of 70 kg and a soil ingestion rate of 100 milligrams per day. Estimated dose calculations do not show a public health concern for most of the population for the metals measured in residential soils.

Residential soil sample X117 contained the highest levels of copper, lead, nickel, and zinc, and were much higher than the second most concentrated sample. This sample is unusual in that the levels found are more concentrated than those found at the other 22 properties.

Arsenic, magnesium, manganese, and nickel were found at concentrations similar to those found in background samples from uncontaminated areas throughout Illinois. IDPH does not believe exposure to these metals at these levels would be a health concern at this site. Exposure to barium in residential soils would not be expected to cause adverse health effects.

The average chromium values for the Sandoval residential samples are less than the average found elsewhere in Illinois. Copper levels were elevated, but no health guideline has been developed for copper. Estimates for exposure to copper in food range from 1-5 mg/day (ATSDR, 1989; Pais and Jones, 1997). Daily contact with copper in soil would result in exposures much less than those from copper commonly found in food, so adverse health effects are unlikely.

Cadmium may be a problem for pica children at about half of the sample locations. Health guidelines for other children and adults would not be exceeded at any of the sample locations. Cadmium is nonessential and accumulates in the kidneys.

Exposure to lead can cause adverse health effects, especially for young children and pregnant women, since lead is a neurotoxin that permanently interrupts normal brain development. Lead has no beneficial biological function and is known to accumulate in the body. ATSDR has not developed a health guideline for lead because no safe threshold has been identified. The U.S. Food and Drug Administration (USFDA) published a provisional tolerable daily lead intake value of 6 micrograms for a 10-kg child based on a blood lead level of 10 micrograms per deciliter. A survey of a variety of foods determined the average adult lead intake to be 54 micrograms per day (ug/day) (ATSDR, 1997).

The Sandoval Zinc smelter did not specifically process lead. Although some lead was likely present in the air emissions from the smelter, large amounts of lead were probably not distributed to off-site residential properties. The range of lead concentrations in the 23 residential samples is 27 to 2,840 ppm. The next highest lead concentrations were 1,150 and 1,060 ppm, so 3 of the 23

yards exceeded the IDPH soil lead level of 1,000 ppm for homes where children with elevated blood lead levels reside (IDPH, 1994). The Sandoval median soil lead value is 189 ppm, which is within the range of typical lead concentrations found in Illinois (Illinois EPA, 1994). Blood samples collected from 33 preschool children in August 1996 did not show an excessive concentration of lead.

Zinc would be expected to be much higher than background samples throughout the community since 100 years of zinc smelting took place to the east of the residential area. The highest zinc concentration in an on-site sample was about 10 times greater than the highest residential sample. The range of zinc levels in residential soils was from 108 ppm to 21,400 ppm. Pica children may ingest excess zinc, but it is unlikely that other persons of any age would be exposed to enough zinc to cause adverse health effects.

Although current estimated ingestion doses of these metals do not appear to consistently exceed health guidelines for most of the population, it is likely that past inhalation exposures to former workers may have been problematic since lung tissues tend to absorb metals more completely than tissues in the gastrointestinal tract. During interviews with Illinois EPA staff in 1996, residents described the symptoms of workers during past smelter operations, which are similar to "metal fume fever" and heat-related illnesses. Reportedly, the presence of thick, white smoke was a common occurrence in the past. No historical exposure data (blood lead levels) are known to exist from any biomonitoring of workers at the smelter. No air sampling data are currently available.

Older children and adults who trespass on the site may regularly be exposed to material high in lead and other metals that are more concentrated near the old smelting operations. Since the frequency of trespass is unknown, estimating potential exposure is very difficult. Still, it is possible that a frequent trespasser may be exposed to metals at levels that would exceed health guidelines.

COMMUNITY HEALTH CONCERNS

No public meeting has been held for this site, but IDPH has participated in community involvement activities with area residents who have asked questions and expressed concerns about issues at the site. The following information is a summary of the health concerns expressed, and IDPH's responses to these questions.

1. What health effects can be caused by exposure to lead in soil?

IDPH has not found any evidence that Sandoval residents are being exposed to high levels of lead in soil. Exposure to lead can cause adverse health effects, especially for young children and pregnant women, since lead is a neurotoxin that permanently interrupts normal brain development. Lead has no beneficial biological function and is known to accumulate in the body. The Sandoval Zinc smelter did not specifically process lead. Although some lead was likely in the air emissions

from the smelter, large amounts of lead were probably not distributed to off-site residential properties.

2. Is trespassing onto the site dangerous?

The remaining buildings on the site are in disrepair. Another physical hazard during rainy seasons is an in-ground reservoir that collects water beneath one building. Construction debris such as lumber, bricks, and concrete chunks was scattered throughout the site. On-site soils contain elevated levels of chemicals, so it is possible that a frequent trespasser may be exposed to chemicals at levels that would exceed health guidelines. Illinois EPA has retained contractors to design a more durable type of fence to deter trespassers.

CHILD HEALTH INITIATIVE

IDPH and ATSDR recognize that children are especially sensitive to some contaminants. For that reason, IDPH includes children when evaluating exposures to contaminants. Children are the most sensitive population considered in this health assessment.

CONCLUSIONS

Overall, the site poses no apparent public health hazard to most of the population in Sandoval. The site may be a public health hazard to preschool children with excessive hand-to-mouth activity exposed to residential surface soils with high levels of lead. However, the blood sample results from children in a day care near the site did not show elevated levels of lead. It is also likely that exposures to older children and adults who trespass onto the site may regularly exceed health guidelines for lead and other metals that are more concentrated near the old smelting operations. Physical hazards exist on the site primarily for trespassers operating recreational vehicles in and around collapsing buildings, household wastes, construction debris, and standing water.

Since primary smelting occurred only during the first 30 years of operation, the trace metals found in ores did not consistently accumulate to high concentrations in residential soils. Secondary smelting of zinc products continued for another 80 years and subsequently zinc concentrations are consistently elevated throughout the community.

Because lead exists in residential yards, educational efforts remain important for families with small children. To date, no child in Sandoval has been identified with an elevated blood lead level.

RECOMMENDATIONS

Many of the recommendations listed in the 1995 IDPH Public Health Assessment have been addressed in some manner. The following are recommended based on current conditions:

1. Continue efforts to prevent trespassing on the site.
2. Continue educational efforts on methods to reduce exposure to metals in the residential environment.
3. Use procedures to minimize dust during on-site remedial operations.

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TABLES

Table 1. Sandoval On-site Soil and Sediment Samples Selected Metals (sampling depth 0-6") in parts per million (ppm) from May 1996 Illinois EPA Sampling Event.											
METAL	X101	X102	X103	X104	X105	X201	X203	X204	X205	X206	X207
Arsenic	44	19	58	32	8	37	20	4B	15	27	18
Barium	155	55B	225	157	160	186	158	113	231	209	114
Cadmium	61	49	19	4	4	6	11	2B	3	15	16
Chromium	22	40	52	24	12	13	15	7.8	12	20	9
Copper	1820	1170	4050	1270	764	725	537	28	57	1090	146
Lead	22300	2460	3220	2700	603	3300	833	50	156	3370	339
Magnesium	840B	4760	709B	496B	1120B	1170B	950B	942B	1300B	1330B	559B
Manganese	293	273	326	683	637	860	1010	502	1820	545	613
Nickel	292	608	3750	530	84	83	242	10B	23	259	17
Zinc	339000	214000	97400	15300	3360	6520	6300	261	2050	39000	2710
Location	Near entry	Near aboveground tank	Near SW corner of furnace	Near SE fence line corner	Pond western bank	Culvert N of RR and E pond	SE ditch	E PPE (Back-ground)	N of RR and W ditch	N of St leading to site	W PPE

B = metal found in laboratory blank

Table 2. Sandoval Residential Property Surface Soil - Selected Metals (0-6" in depth) in parts per million (ppm) from May 1996 Illinois EPA Sampling Event.													
SAMPLE	X106	X107	X108	X109	X110	X111	X112	X113	X114	X115	X116	X117	Comparison Values Pica/Child/Adult
Arsenic	9	11	8	22	12	6	45	5	11	11	8	35	0.6/20/200 EMEG
Barium	106	135	133	131	304	123	283	85	237	127	226	219	100/4000/50000 RMEG
Cadmium	0.5B	3	0.3B	0.5B	19	0.8B	7	0.4B	1B	0.5B	1B	5	0.4/10/100 EMEG
Chromium	10	10	11	11	52	9	26	7	14	12	8	16	10/300/4000 RMEG
Copper	21	503	14	155	133	42	408	36	96	33	68	1630	NONE
Lead	69	1060	27	174	220	131	1150	85	248	47	217	2840	NONE
Magnesium	1010B	3070	787B	958B	2420	1340B	4020	436B	515B	2620	704B	3040	NONE
Manganese	591	384	248	192	299	494	479	371	245	417	856	355	10/300/4000 RMEG
Nickel	10	67	7B	24	55	25	258	14	10B	13	19	495	40/1000/10000 RMEG
Zinc	349	5200	112	791	1290	554	12500	442	464	272	773	21400	600/20000/200000 CEMEG
LOCATION	Park	School grounds	19 Orchard (Back-ground)	High School	Orange behind daycare	RT 50 E of site	Gore home	N	4162 RT 51	Spa	503 Scott	111 Scott	

Table 2 (continued). Sandoval Residential Property Surface Soil - Selected Metals (0-6" in depth) in parts per million (ppm) from May 1996 Illinois EPA Sampling Event.												
SAMPLE	X118	X119	X120	X121	X122	X123	X124	X125	X126	X127	X128	Comparison Values Pica/Child/Adult
Arsenic	12	12	8	16	1B	10	6	9	6	9	6	0.6/20/200 EMEG
Barium	370	362	202	478	51	86	198	213	127	132	97	100/4000/50000 RMEG
Cadmium	2	1	2	5	0.6B	0.3B	0.7B	4	0.3B	0.7B	0.7B	0.4/10/100 EMEG
Chromium	25	15	8	24	7	12	16	17	10	13	8	10/300/4000 RMEG
Copper	107	51	197	204	13	20	45	84	17	152	45	NONE
Lead	266	385	418	747	33	49	135	170	39	274	189	NONE
Magnesium	1050B	793B	1140B	2090	9090	939B	2170	1090B	1130B	1460	768B	NONE
Manganese	363	946	631	1020	179	508	562	584	512	615	444	10/300/4000 RMEG
Nickel	18	17	24	28	12	6B	19	17	9B	61	13	40/1000/10000 RMEG
Zinc	897	591	2090	1650	226	108	431	1420	150	1200	1270	600/20000/200000 CEMEG
LOCATION	N Main	School-yard	Clay	114 S. Main	Pearl	Maple	Wyoming	Maple	Main	Nevada	887 Cemetery	

Table 3. Comparison of Sandoval Residential Soil Samples to Illinois Background Levels (in milligrams per kilogram).						
METALS	Off-site Soil			Illinois Urban Soils(a)		
	Range	Mean	Median	Ranges	Mean	Median
Arsenic	1-45	12	9	1.1-24	7.4	7.2
Barium	51-478	192	135	<5-1720	133	110
Cadmium	0.3-19	2.4	0.8	<2.5-8.2	1.3	0.6
Chromium	7-52	15	12	<2-151	21.2	16.2
Copper	13-1630	177	68	<3-156	28.9	19.6
Lead	27-2840	390	189	4.7-647	71.1	36
Magnesium	436-9090	1853	1130	541-74500	10872	4820
Manganese	179-1020	491	479	155-5590	742	636
Nickel	7-495	53	18	<3-135	20.9	18
Zinc	23-21400	2356	773	23-798	137.9	95.0

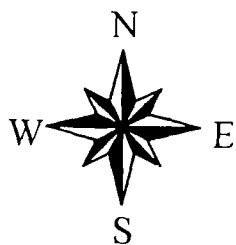
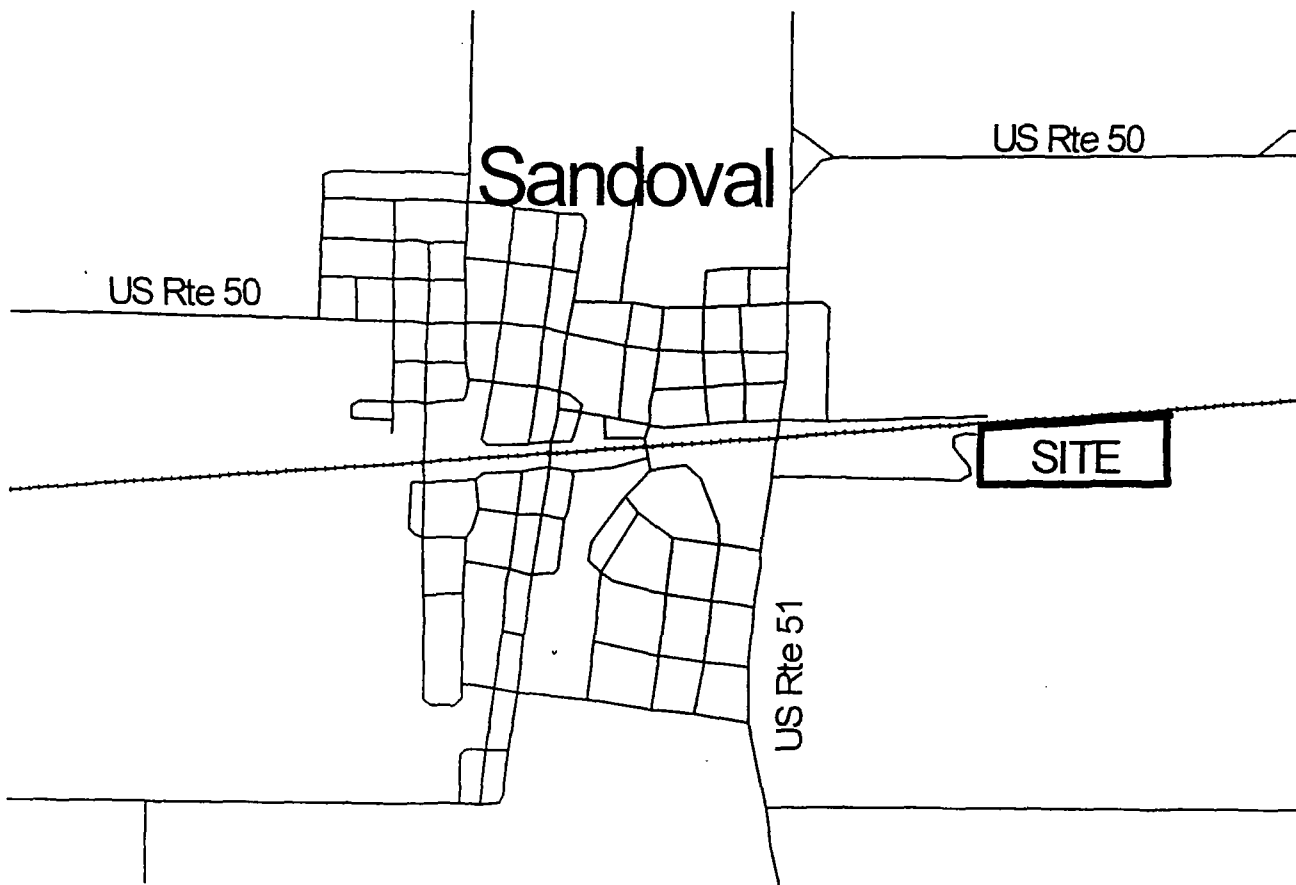
a) "A Summary of Selected Background Conditions for Inorganic in Soil" Illinois EPA/ENV/94-161, August 1994.

Table 4. Completed Exposure Pathways

Pathway Name:	Source	Medium	Exposure Point	Exposure Route	Receptor Population	Time of Exposure	Exposure Activities	Estimated Number Exposed	Chemicals (Identify by name or reference to table in document)
Off-site Surface Soil	Smelter	Residential Soil	Yards	Ingestion Inhalation	Residents	Past Present Future	Contacting contaminated soil.	1,500	Table 3
On-site Surface Soil	Smelter	Surface Soil	Surface material	Ingestion Inhalation	Trespassers	Past Present Future	Contacting contaminated material.	30	Table 1
Contaminated Air	Smelter	Air	Site and surrounding area	Inhalation	On-site Smelter Workers; Area Residents	Past	Primary and Secondary Smelting	2,000	Table 1

ATTACHMENTS

Location of Sandoval Zinc



Comparison Values Used In Screening Contaminants For Further Evaluation

Environmental Media Evaluation Guides (EMEGs) are developed for chemicals based on their toxicity, frequency of occurrence at National Priority List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not cut-off levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference Dose Media Evaluation Guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations based on a one excess cancer in a million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.